

Exhibit 17

filter

NOUN

Etymology

Summary

A borrowing from Latin.

Etymon: Latin *filtrum*.

< **post-classical Latin** *filtrum* (also *feltrum*, *fultrum*) felt horse-cloth (8th cent.), felt, piece of felt (11th cent.; frequently from c1200 in British sources), (specifically) piece of some material through which liquids are passed (from 13th cent. in British sources: see [felt n.¹](#)).

Compare **Middle French**, **French** *filtre* (1575, earliest in sense ‘apparatus for freeing liquids from impurities’; for the **French** noun for ‘felt’ see [fewter n.](#)), **German** *Filter* (1585 as *filtrum*, and until the 18th cent. with **Latin** inflectional endings; earliest with reference to a piece of porous material though which a liquid is passed: see sense 2b).

Notes

Specific senses

With sense 4c compare **French** *filtre* (1904 in this sense).

Specific forms

The form *fertre* probably reflects association with [felt n.¹](#), although compare **post-classical Latin** *feltrum* (from 11th cent. in British sources).

In β forms by association with [philtre n.](#).

Meaning & use

1. † Felt; (also) a piece of felt. Obsolete.

?a1425

?a1425 þai dwell all in tentez made of blakk [filtre](#).

Mandeville's Travels (Egerton MS.) (1889) 152

?a1425 þan es he sette apon a blak [filtre](#), with þe whilk þai lift him vppe and settez him in his trone.

Mandeville's Travels (Egerton MS.) (1889) 125

- 2.a. A strip or thread of felt, cloth, or other absorbent material, through which liquid is drawn by capillary action and collected in a separate vessel, thus freeing it of any suspended matter. Cf. **felt n.¹** 2a. Now only in **capillary filter n.** ?a1425-

The sense in quotes. ?a1425 and 1544 is ambiguous; they may instead belong at sense 2b.

- ?a1425 Lac virginis..bat is made of litarge & tempred wip white acet distilled with a **filtre** [?c1425 Paris MS. by **filtre**; Latin *cum filtro*].
translation of Guy de Chauliac, *Grande Chirurgie* (N.Y. Acad. Med. MS.) f. 125 (Middle English Dictionary)
- 1544 Take .iii, ounces of litarge of siluer fyne poudred, halfe a pynte of good whyte vinegre, mixt them togyther, & distylle them by a **fyltre**, or throughe a lytle bagge or by a pece of cloth.
T. Phaer, translation of J. Goeurot, *Regiment of Lyfe* (new edition) ii. f. xi
- 1559 Destillacion by a **Filter** [Latin *per filtrum*] or a list of Wollen cloth.
P. Morwyng, translation of C. Gesner, *Treasure of Euonymus* 75
- 1576 By the beake or nose of the Lymbecke, with a thread draw the **Fyltre** of a finger breadth cut, so highe vp, that for the strayghtnes of the Nose, the **Fyltre** wyll no further followe.
G. Baker, translation of C. Gesner, *Newe Jewell of Health* iv. f. 232^v
- 1644 When these partes of water are gott vp to the toppe of the vessell on which the **filter** hangeth, and ouer it on the other side by sticking still to the towe,..they fall downe againe by little and little.
K. Digby, *Two Treatises* i. xix. 167
- 1728 **Filtres** are of two sorts... The second are twisted up like a Skain or Wick... By means hereof, the purest Part of the Liquor distills Drop by Drop out of the vessel.
E. Chambers, *Cyclopaedia* at *Filtre*
- 1746 The **filtre** here meant is a twist of linnen thread or cotton laid over the edge of the vessel, one end touching the liquor within, and the other hanging without.
H. Pemberton in translation of *Dispensatory Royal Coll. Physicians* 161

- 2.b. A thin piece (or esp. in early use a bag) of felt, cloth, mesh, or other porous material (now typically unsized paper) through which liquid is passed to free it of suspended matter. Cf. **felt n.¹** 2a. 1576-

bag-filter, membrane filter: see the first element.

- 1576 This is a Bagge which the Chimistes make of whyte Woollen cloth..shaped and sownen after this manner, and name it a **Fylter**.
G. Baker, translation of C. Gesner, *Newe Jewell of Health* i. f. 21
- 1612 Sir please you Shall I not change the **feltre**?
B. Jonson, *Alchemist* ii. iii. sig. D4
- 1683 Dissolve the Vitriol, and purify it through a **Filtre**.

J. Pettus, translation of L. Ercker ii. xlvi. 214 in *Fleeta Minor* i

- 1770** The clear liquor being decanted, the remainder was passed through a filter.
T. Lane in *Philosophical Transactions* 1769 (Royal Society) vol. 59 220
- 1812** The whole is then to be poured upon a filtre of cloth.
H. Davy, *Elements of Chemical Philosophy* 285
- 1846** Collected on a filter, washed and dried.
J. Baxter, *Library of Practical Agriculture* (ed. 4) vol. I. 53
- 1900** Collect the deposit on a filter and dry it in an oven or before a fire.
Artist January 72/1
- 1949** Cases where the oil has to pass through an unheated filter of very fine mesh where suspended solid wax crystals would be liable to collect on the filtering surface and retard the rate of filtration.
Our Industry (Anglo-Iranian Oil Co.) (ed. 2) xiii. 291
- 1956** Particulate matter in the water samples was separated on millipore filters.
Limnol. & Oceanography vol. 1 203/1
- 2015** Use two paper filters, fitted together, each time you brew a pot of coffee. The strength of two keeps them from collapsing.
Dayton (Ohio) Daily News (Nexis) 6 May d3

- 2.c.** More widely: any of various devices or other methods used to remove suspended or dissolved impurities from liquid; esp. a vessel in which liquid passes through a layer of sand, charcoal, mesh, or some other porous material. 1791-

charcoal filter, percolating filter, water filter, etc.: see the first element.

- 1791** The filters will be cleansed by .
J. Peacock, *British Patent* 1844
- 1834** An improved filter for water or other liquids.
British Patent 6708
- 1867** Nevertheless the natives had scraped small holes in the sand, as filters.
S. W. Baker, *Nile Tributaries of Abyssinia* xx. 502
- 1911** Sand filters had been used in Britain since about 1829.
Times Engin. Supplement 22 March 27/4
- 1953** After use the components of the filter should be sterilized and cleaned.
R. W. Fairbrother, *Text-book of Bacteriology* (ed. 7) vi. 67
- 2010** The lulling sound of the water filter bubbles just off-screen.
J. W. Whitehead, *Appraising Graduate* ii. v. 76



Any material suitable for use as a filter.

- 1823** The burning it [sc. charcoal] over and over again..produces a better **filtre** than at first.
J. Badcock, *Domestic Amusements* 26
- 1870** This [sc. cotton-wool] was the **filter** used by Schroeder in his experiments on spontaneous generation.
Nature 27 January 341/2
- 1909** Charcoal as a **filter**.
W. S. C. Russell & H. C. Kelly, *Lab. Manual First Year Science* 31 (heading)
- 1987** Gravel was recommended as an excellent **filter**, if available.
Research & Devel. in Agriculture vol. 4 109/2
- 2009** Sand is not only a good **filter** but also is porous and allows water to filter through quickly.
J. Soukhome et al., *Watershed Investig.* xii. 155

chemistry

- 2.e.** A device or other method used to remove smoke, dust, germs, or other impurities from the air. **1825-**

air filter: see **air n.**¹ Compounds C.2.

- 1825** The wetted sponge acts as a **filter**, separating and taking up the deleterious matters, and allowing the pure air to pass to the lungs.
London Journal of Arts & Sciences vol. 10 153
- a1884** A protective ventilator consisting of a cloth interwoven with thin brass wire to act as a **filter** for the air.
E. H. Knight, *Practical Dictionary of Mechanics* Suppl. 15/2
- 1937** Billions of infinitesimal germ-laden particles, present in air that has not been cleaned, are caught and *held* by these **filters** at the air-intake.
American Home April 62/1 (advertisement)
- 1957** With **filters** in his nose to keep out germs, and gloves on his hands to prevent contact.
I. Asimov, *Naked Sun* ii. 22
- 1986** The..system circulates warm air through the purifying **filter** to remove any dust particles.
Photographer May 30/2 (advertisement)
- 2008** Aftermarket **filters** deliver cooler, clean air needed for extended engine life, better fuel economy and additional power.
Vancouver Province (Nexis) 11 April c14

- ? **filtrative** and in extended use. Anything which serves as a selectively permeable barrier, through which only some things may pass. **1605-**

- 1605 The common salte..passing through the philter of the earth [Latin *filtro terrae*].
T. Tymme, translation of J. Du Chesne, *Practise of Chymicall & Hermeticall Physicke* i. v. sig. D2^v
- 1672 A Filtre to the transient Sap.
N. Grew, *Anatomy of Vegetables* i. 21
- 1780 A secondary nature, which they [sc. the matters which are converted into calxes] have contracted, by passing through filters in which they have degenerated from their original character.
Monthly Review vol. 61 534
- 1802 This natural filter [sc. the bill of a duck].
W. Paley, *Natural Theology* xii. 241
- 1873 A heavy conversation of ponderous compliments passed through the dragoman filter.
H. B. Tristram, *Land of Moab* xii. 228
- 1911 The universe..can only be a system of laws if phenomena have passed beforehand through the filter of an intellect.
A. Mitchell, translation of H. Bergson, *Creative Evolution* iv. 356
- 1990 After impulses have been generated in the mind..they encounter a variety of filters which determine whether the impulse is acted upon.
Psychol. Rep. vol. 66 iii. 2
- 2011 The harassed consumer of information turns to filters to separate the metal from the dross; filters include blogs.
J. Gleick, *Information* xv. 410

- 4.a. A cylindrical pad of absorbent material fitted at the mouth end of a manufactured cigarette, or placed in the end of a hand-rolled cigarette, in order to reduce harmful ingredients in the inhaled smoke. Also: a manufactured cigarette fitted with such a pad. 1870-

Quot. 1851 shows a use of sense 2e in the context of removing some substances from the smoke inhaled from a type of modified cigar.

- [1851] A prepared medium in the mouth piece of the cigarilla, which, acting as a filter, absorbs all the empyreumatic oil.
Morning Chronicle 12 August 6/2]
- 1870 Such a filter may be included in the manufacture of a cigar or cigarette by rolling it up in the outer wrapper.
Patents for Inventions: Abridgm. Specif. Tobacco 139
- 1908 A large proportion of the objectionable oils formed during smoking is arrested in the wool filter.
Lancet 21 March 907/2
- 1956 Everybody rides like mad in automobiles or flies, plays golf, shoots craps, ruins their eyes on television, smokes filters and drinks vodka.

1994 I insert a filter at the end of my cigarettes as I roll them.

Irish Times 15 Han. 15/5

2011 If you smoked a filter, you switched to a nonfilter.

Charleston (W. Va) Gazette (Nexis) 1 May 1f

tobacco

- 4.b.** **Photography.** A device placed over the lens of a camera to absorb light of certain wavelengths or polarities. 1874-

Recorded earliest in **light filter n.**

colour filter, light filter, sky filter, etc.: see the first element.

1874 The other two kinds of light filters he uses require to be worked with full, or almost full, apertures.

British Journal Photography 7 August 375/2

1958 Light filters are transparent, coloured discs which are attached to the camera lens for the purpose of modifying the colour quality of the light transmitted.

Newnes Complete Amateur Photography viii. 97

2001 When polarizers are used with a wide-angle lens..the thickness of the filter will cause vignetting.

Outdoor Photographer August 87/1

photography

- 4.c.** **Radiology and Nuclear Physics.** An object or device that is placed in the path of a beam of X-rays, particles, etc., in order to absorb components of specific wavelengths or energies. 1903-

1903 Selective filters should be employed to strain out undesirable radiations.

Electrical Review 12 December 849/2

1969 We can..use a sufficiently thick block of graphite as a filter which..removes all neutrons with a wavelength greater than 0·67 nm.

G. E. Bacon, *Neutron Physics* x. 127

2006 MXF Technologies has developed tunable monochromatic X-ray filters that can be attached to a standard X-ray tube.

Washington Post (Nexis) 15 May d5

radiology

nuclear physics

electronics. A passive circuit that attenuates all signals except those of specific frequencies. 1908-

Recorded earliest in **wave filter n.**

- 1908** This machine has been used with a wave **filter**, consisting of series inductances of low effective resistance and parallel capacities.
London, Edinburgh & Dublin Philosophical Magazine 6th Series vol. 16 481
- 1923** A **filter** is generally employed with high-frequency amplifiers for preventing signals from other stations than the one sought being amplified.
Harmsworth's Wireless Encyclopedia 933
- 1955** There must be employed in the video section a 4·5-Mc rejection **filter** to remove the audio carrier and its sidebands from the video signal.
G. M. Glasford, *Fundamentals of Television Engineering* xvii. 581
- 2004** More than 50 new synth-engine parameters including multi-mode **filters**, envelopes, LFOs and more.
Keyboard February 51/1 (advertisement)
- 2015** This variation of the voltage level, called a ripple, can be smoothed out to some extent by employing a **filter**.
A. Hemami, *Electr. & Electronics for Renewable Energy Technology* xvi. 488

electronics

- 4.e. Computing.** A program or software function that removes or hides certain emails, web pages, search results, etc., according to preset rules or conditions. Frequently with distinguishing word, as **parental filter**, **search filter**, **spam filter**, etc. 1986-

- 1986** Would employees..want their supervisors to know that they had **filters** selecting notices about job opportunities in other parts of the company?
T. Malone et al., *Intelligent Information Sharing Syst.* 26
- 1994** Mail **filters** are only useful in any E-mail system if you are getting lots of E-mail, at least a dozen messages a day.
InfoWorld 31 October 138/2
- 2000** Some search engines, including Excite, let you turn on a family 'filter' that blocks known porn sites.
Today's Parent October 142/2
- 2005** The risk that legitimate e-mail may be mistakenly blocked by a **spam filter**..has given many companies sleepless nights.
Computer Weekly 19 April 54/1
- 2013** You can use the site to search for advisers in your area and can set **filters** to find specialists who have higher-level qualifications.
Times (Nexis) 13 July 62

computing

- 5.** Chiefly British and Irish English. In a road traffic system: an arrangement allowing or directing vehicles to turn right or left at an intersection or other junction, typically independently from the flow of traffic going straight ahead; a lane for this purpose. Also: a traffic light signalling this, usually displaying an illuminated green arrow. Cf. [filter](#) v. 3c.

1939-

Recorded earliest in *filter light*: see [Compounds C.1b](#).

- 1939** Filter lights, to permit traffic to make left turns at some of the light-controlled crossings in Dublin while the normal cross-traffic is held up.
Irish Times 5 August 6/1
- 1955** In reply to a Question which I asked last week about the filter, he said that he was advised that it was bad for traffic, but can he say how a filter to the left can possibly be bad for traffic?
Hansard Commons 22 March 1870
- 1987** Rather than the signal disappearing to show that the filter had ended and oncoming traffic could be expected, the green became 'solid'.
Guardian 23 February 20/8
- 1995** Beyond the north pier I got up into fourth and did forty then changed down smoothly at the filter by the Gathering Halls.
A. Warner, *Morvern Callar* (1996) 56

British English

Irish English

- 6.a.** A program or (now usually) software feature used to alter the overall appearance of a digital image in a specific manner. Cf. senses [4b](#), [4d](#). 1965-

- 1965** Two-dimensional digital filters were programmed which determined the magnitude of the unwanted frequency at each point in the picture and then subtracted these noises out.
Space Programs Summary: Supporting Research & Adv. Development No. 37-31. iii. 26/1
- 1982** The proposed two-dimensional digital filters can be applied to the restoration of blurred images.
Proceedings 8th Triennial World Congr. International Federation of Automatic Control 1981 vol. I. 271/2
- 1991** Aldus Gallery Effects, Volume I: Classic Art comes with 16 artistic filters, including chalk and charcoal, watercolor, fresco, chrome, graphic pen, and film grain.
Infoworld 6 May 48/2
- 2000** The best technique for this is the Unsharp Mask filter in Photoshop. Unsharp Masking is the traditional film compositing technique used to sharpen edges in an image.
G. L'E. Turner, *Elizabethan Instrument Makers* ii. 290
- 2015** Instagram's two dozen filters ..adjust for brightness, contrast, saturation and 'warmth'.
Buffalo (New York) News (Nexis) 14 September d41

computing

- 6.b. Computing.** A program or software function that processes data, and orders or reformats it 1966- according to some preset rule or condition.

1966 *Filter* ...2. A device or program that separates data, signal, or material in accordance with specified criteria.

C. J. Sippl, *Computer Dictionary & Handbook* 128/1

1981 I run the bulletins through a *filter* to convert everything to lower case.

Arrl Bulletin in *net.ham-radio* 13 November

2001 *Filter*, in general a program that inputs a set of data items, performs some operation on each item, and outputs the modified results.

D. Pountain, *New Penguin Dictionary of Computing* 185/2

2013 This chapter also explains how to redirect input to and output from a command, construct pipelines and *filters* on the command line, and run a command in the background.

M. G. Sobell, *Pract. Guide Linux Commands, Editors, & Shell Programming* (ed. 3) v. 126

computing

Pronunciation

BRITISH ENGLISH	U.S. ENGLISH
/'filtə/	/'filter/
FIL-tuh	FIL-tuhr



Pronunciation keys

Forms

Variant forms

a.

late Middle English-1800s	filtrē
1500s	fylter, fyltre, fylture
1500s-1600s	feltre
	filter

1600s	philter
1600s-1700s	philtre

Frequency

filter is one of the 5,000 most common words in modern written English. It is similar in frequency to words like *completion*, *constituent*, *feminist*, *sink*, and *unite*.

It typically occurs about 20 times per million words in modern written English.

filter is in frequency band 6, which contains words occurring between 10 and 100 times per million words in modern written English. [More about OED's frequency bands](#)

Frequency data is computed programmatically, and should be regarded as an estimate.

Frequency of *filter*, n., 1750–2010

* Occurrences per million words in written English

Historical frequency series are derived from Google Books Ngrams (version 2), a data set based on the Google Books corpus of several million books printed in English between 1500 and 2010.

The overall frequency for a given word is calculated by summing frequencies for the main form of the word, its plural or inflected forms, and any major spelling variations.

For sets of homographs (distinct entries that share the same word-form, e.g. *mole*, n.¹, *mole*, n.², *mole*, n.³, etc.), we have estimated the frequency of each homograph entry as a fraction of the total Ngrams frequency for the word-form. This may result in inaccuracies.

Frequency of *filter*, n., 2017–2024

* Occurrences per million words in written English

Modern frequency series are derived from a corpus of 20 billion words, covering the period from 2017 to the present. The corpus is mainly compiled from online news sources, and covers all major varieties of World English.

Compounds & derived words

Sort by Date (oldest first)

filter bag, n. 1559-

a. A bag used as a filter; b. Photography a...

filter, v. 1576-

transitive. To pass (a liquid) through a filter...

filtered, adj. ?1600-

that has been filtered; that has been subjected...

filter paper, n. 1670-

Unsized porous paper used to filter liquids; a...

filter press, n. 1817-

a filter through which liquid is forced by the...

water filter, n. 1821-

Any of various devices for the filtration of...

filter bed, n. 1828-

A layer of sand, gravel, or other porous material...

bag filter, n. 1834-

A filter or device in which a gas or liquid is...

filter faucet, n. 1846-

A faucet incorporating a filter to remove...

pressure filter, n. 1850-

A filter through which liquid is forced by...

air filter, n. 1853-

An apparatus for extracting extraneous or harmful...

bottle filter, n. 1853-

A bottle containing filtering material, or fitted...

oil filter, n. 1853-

filter cake, n. 1861-

The insoluble residue left on a filter following...

filter pump, n. 1861-

A device in which liquid is forced through a...

capillary filter, n. 1864-

A filter in the form of a strip or thread of...

ray filter, n. 1865-

†a. A substance that is transparent to...

filter flask, n. 1869-

A conical flask with a short protruding tube on...

filter coffee pot, n. 1870-

a. A (typically ceramic) coffee pot, the upper...

light filter, n. 1874-

Filter that modifies the intensity, spectrum...

filter coffee, n. 1875-

a. (A drink of) coffee prepared by allowing...

sack-filter, n. 1875-

A form of filter used in sugar-refining (E. H...

wort filter, n. 1875-

A filter used to remove solids such as ground...

exfiltration, n. 1878-

The action or process of filtering out.

filter cell, n. 1880-

a. A compartment inside which liquid or gas is...

gelatin filter, n. 1890-

Photography and Theatre. A light filter made from...

colour filter, n. 1891-

A filter that removes certain wavelengths or...

heat filter, n. 1894-

Any device that selectively removes heat...

sand filter, n. 1894-

A filter used in water purification consisting of...

filterless, adj. 1899-

Lacking a filter (in various senses of the noun)...

filter cartridge, n. 1900-

A cartridge containing a filter, typically...

filter feed, n. 1901-

Material that is to be filtered; (also) the flow...

percolating filter, n. 1901-

A type of filter used in the treatment of sewage...

filter factor, n. 1904-

A numerical measure of the darkness or density of...

filter-passer, n. 1906-

A substance or organism capable of passing...

wave filter, n. 1908-

= filter, n. 4d.

filter-passing, adj. 1910-

Able to pass through a filter; = filterable, adj. I.

microfilter, n. 1911-

A filter for separating out small quantities of...

prefilter, n. 1911-

filter circuit, n. 1912-

A passive circuit that attenuates all signals...

filter aid, n. 1914-

Any of various powders used to increase the...

sky filter, n. 1915-

A lens filter, usually having a yellow upper...

filter condenser, n. 1920-

= filter capacitor, n.

sun filter, n. 1921-

a. Something such as a blind for a window or a...

filter reactor, n. 1922-

= filter inductor, n.

membrane filter, n. 1922-

A sheet or film of a polymer (originally...

filter capacitor, n. 1927-

A capacitor used as an electronic filter, esp. as...

filter feeding, n. 1927-

The process or action of obtaining nourishment by...

filter inductor, n. 1927-

An inductor used as an electronic filter, esp. as...

filter-tipped, adj. 1927-

(Of a manufactured cigarette) fitted with a filter tip.

filter feeder, n. 1928-

An aquatic animal or organism that obtains...

scratch filter, n. 1929-

A filter (filter, n. 4d) designed to reduce the...

filter-feeding, adj. 1931-

designating an aquatic animal or organism that...

filter tip, n. 1932-

A cigarette filter; (also) a manufactured...

lattice filter, n. 1935-

A filter (filter, n. 4d) consisting of components...

biofilter, n. 1936-

A filter or filtration device used for biofiltration.

filter shot, n. 1937-

A photograph or cinematographic sequence whose...

slope filter, n. 1937-

A filter whose response increases or decreases...

filter bank, n. 1938-

An array of filters (filter, n. 4d) used to...

filter cigarette, n. 1938-

A filter-tipped cigarette.

polarizing filter, n. 1939-

A piece of transparent material through which...

comb filter, n. 1941-

(See quot. 1960).

smoothing filter, n. 1941-

skylight filter, n. 1950-

A lens filter, usually having a slight magenta...

filter feed, v. 1953-

intransitive. Of an aquatic animal or organism...

filter tipping, n. 1954-

The action or process of fitting a cigarette with...

filter-caked, adj. 1956-

That has become a filter cake.

noise filter, n. 1960-

A filter for selectively reducing noise.

notch filter, n. 1962-

A filter that attenuates signals within a very...

Nafion, n. 1973-

proprietary name for: a perfluorinated polymer...

charcoal-filter, n.

A filter in which charcoal is used to absorb...

cistern-filter, n.

tube-filter, n.

In a tube-well, a strainer to prevent gravel from...

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